CAUCASIANA
Journal on the biodiversity of the Caucasus and the adjacent regions

Caucasiana 4: 163–171 (2025)
DOI: 10.3897/caucasiana.4.e172790

Research Article

The first record of *Calamoceras illiesi* Malicky & Kumanski, 1974 (Trichoptera, Calamoceratidae) and confirmation of the occurrence of *Mystacides azureus* Linnaeus, 1761 (Trichoptera, Leptoceridae) from Georgia

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Abstract

In this paper, we provide evidence of the presence of *Calamoceras illiesi* Malicky & Kumanski 1974 in the South Caucasus for the first time. In addition, the occurrence of *Mystacides azureus* Linnaeus, 1761 is confirmed in Georgia, with the initial photograph observation in social media supported by the collection of specimens from several locations in the country. Detailed collection data, photos of preserved specimens, and habitat of *C. illiesi* in Georgia are provided along with a map of known records for both species.

Key words: biodiversity, caddisflies, faunistics, Kvereti Managed Reserve

OPEN ACCESS

Academic editor: Levan Mumladze
Received: 22 September 2025
Accepted: 4 November 2025
Published: 3 December 2025

ZooBank: https://zoobank.org/88B523AD-72F7-4368-BF2C-70EB5ABE691C

Citation: Memishishi A, Dzuliashvili K, Japoshvili B (2025) The first record of *Calamoceras illiesi* Malicky & Kumanski, 1974 (Trichoptera, Calamoceratidae) and confirmation of the occurrence of *Mystacides azureus* Linnaeus, 1761 (Trichoptera, Leptoceridae) from Georgia. Caucasiana 4: 165–171. https://doi.org/10.3897/caucasiana.4.e172790

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Introduction

Caddisflies (Trichoptera) are a globally diverse group, yet they remain understudied in many developing countries. The biodiversity of the freshwater ecosystems of Georgia is under-researched (NBSAP 2014; Japoshvili et al. 2016; Mumladze et al. 2020), with aquatic insects, including caddisflies, being no exception. This is reflected in over 100 caddisfly species having been added to the Georgian list in the 2020s alone, and it is believed that many more remain to be discovered (personal communication with János Oláh).

The history of research on Georgian and Caucasian caddisflies dates back to the 19th century with the work of Robert McLachlan (McLachlan 1869, 1876). However, the most substantial early contributions came from Martynov, who described a total of 35 new species and recorded 46 species for the first time in Georgia (Martynov 1913a, b, 1915, 1918, 1925, 1926, 1927, 1934). In the following decades, various local and foreign researchers contributed by describing 18 new species and recording several species for the first time in Georgia (Elanidze 1946; Murvanidze 1948; Lepneva 1956, 1958, 1961; Botosaneanu 1967; Zosidze 1973, 1999a, b, 2002; Malicky 1974; Malicky and Oláh 1979; Mey and Müller 1979; Mey and Joost 1982; Oláh 1985; Spuris 1988; Pankvelashvili et al. 2020).

A new era in the study of Georgian caddisflies began in 2019, driven by János Oláh's exceptionally productive work describing over a hundred species (Oláh et al. 2019, 2020; Oláh and Vinçon 2024). Although clearly considerable progress has recently been made, there remains much to explore in the study of local caddisflies. Through our investigation of the caddisfly fauna of Georgia, we present two additional species: *Calamoceras illiesi* Malicky & Kumanski, 1974, and *Mystacides azureus* Linnaeus, 1761, both of which are recorded for the first time in Georgia (Fig. 6).

Material and methods

The larva of *Calamoceras illiesi* was collected using a hand net. The imago of *C. illiesi* and *Mystacides azureus* were caught using a butterfly net. All specimens were preserved in 95% ethanol and then stored in a freezer at -22 °C. If a detailed examination of adults was necessary, the abdomens were cleaned in a 10% KOH solution and transferred to glycerol for further preservation and storage. For identification of the larva and imago of *C. illiesi*, the descriptions by Sipahiler (2013) and Malicky (2004) were used, while for *M. azureus*, the description by Malicky (2004) was utilised. All examined material is kept in the collection of the Museum of the Institute of Zoology, Ilia State University, Tbilisi (hereafter IZISUT).

The map of sampling locations was made in the QGIS software (QGIS Development Team, 2024). Photos of the preserved specimens were taken using a Canon EOS 60D camera with a Canon EF-S 60mm f/2.8 Macro USM Lens. Digital images were prepared using Zerene Stacker image stacking software and Adobe Photoshop CS6.

Results

Order Trichoptera

Family Calamoceratidae Ulmer, 1905

The family Calamoceratidae is primarily found in tropical and subtropical regions, with its presence in Europe limited to the genus *Calamoceras* Brauer, 1865 (García de Jalon et al. 1987). Calamoceratidae larvae are among the largest case-bearing caddisfly larvae, partly due to their distinctive body shape. Although similar to other caddisfly families, they can be differentiated by morphological characteristics such as a transverse row of about 16 long stout setae in the central part of the labrum, sharp ventral anterior margins of the pronotum and dorsal plates of mesonotum, and specific blurred margins (Wiggins 1977; Evtimova and Kenderov 2016). Larvae are found sporadically in detritus accumulations of stream pools (Morse 2004).

Genus *Calamoceras* Brauer, 1865

The *Calamoceras* larvae are characterised by the combination of the following features: a transverse row of 22-32 stout setae on the labrum; hook-shaped fore trochantin; pronotum with elongated and pointed anterolateral

corners of the pronotum, roughly equal in length middle and hind legs and short forelegs; two sclerotised plates on mesonotum; membranous metanotum with seta-bearing very small four sclerites, and elongated sclerites on each site, both bearing a few setae. Additionally, the anal claws possess an accessory hook, and the case is made from pieces of wood (Sipahiler 2013; Evtimova and Kenderov 2016).

To date, the genus includes three species: *C. markusha* (Brauer, 1865), *C. illiesi* (Kumansky and Malicky 1974), and recently described *C. riffensis* Harrak, El Alami & Morse 2024 from Morocco.

***Calamoceras illiesi* (Malicky & Kumanski, 1974)**
Figures 1–3

Material examined. GEORGIA • 2♀♀, 17 larvae; Sachkhere, Kvereti Managed Reserve, N42.37408, E43.43789; 1774 a.s.l.; small, unnamed mountain brook (Fig. 5); 05.25.24; leg: Memishishi A. and Dzuliashvili K.

Remarks. *C. illiesi* is recorded in Bulgaria, Croatia, Greece, Türkiye, and North-Western Russia (Evtimova and Kenderov 2016). In the Caucasus, the genus is represented by a single species, *C. illiesi*, which occurs in the Western Caucasus (Novorossiysk and Sochi) and in the North Caucasus (the southwest of Dagestan) (Ivanov 2011).

Family Leptoceridae Brewster, 1815

The Leptoceridae, commonly known as long-horned caddisflies, is one of the largest families within the order, comprising over 1970 described species classified into 46 extant genera globally (Wiggins 1977; Morse 2011).

Adults of the family Leptoceridae are characterised by extremely long, slender antennae, often 2–3 times the length of the forewings, which distinguishes them from most other Trichoptera families. The head is broad and may bear distinctive sensory projections in some genera. Maxillary palps are five-segmented in both sexes, often modified in males, with the terminal segment annulated or whip-like. The forewings are narrow and covered in dense hairs, with simplified venation; diagnostic features include the branching of vein RS and a characteristic short M-Cu cross vein (Wiggins 1977; Vshivkova et al. 1997; Holzenthal et al. 2007).

Genus *Mystacides* Berthold, 1827

The genus *Mystacides* Berthold, 1827 comprises 25 documented species (Morse and Yang 2002; Kuhara et al. 2023) and occurs across temperate regions of the Northern Hemisphere as well as tropical and subtropical areas of Asia. Adults are described as medium-sized, with elongated slender bodies, typically ranging from 7–12 mm; wings often with a distinct metallic, dark brown to bluish iridescent sheen; forewings are usually without any pattern or faintly spotted; maxillary palps composed of five parts, with sexually dimorphic segmentation in particular species; head hypognathous, with large compound eyes (Wiggins 1964, 1977; Morse and Yang 2002).

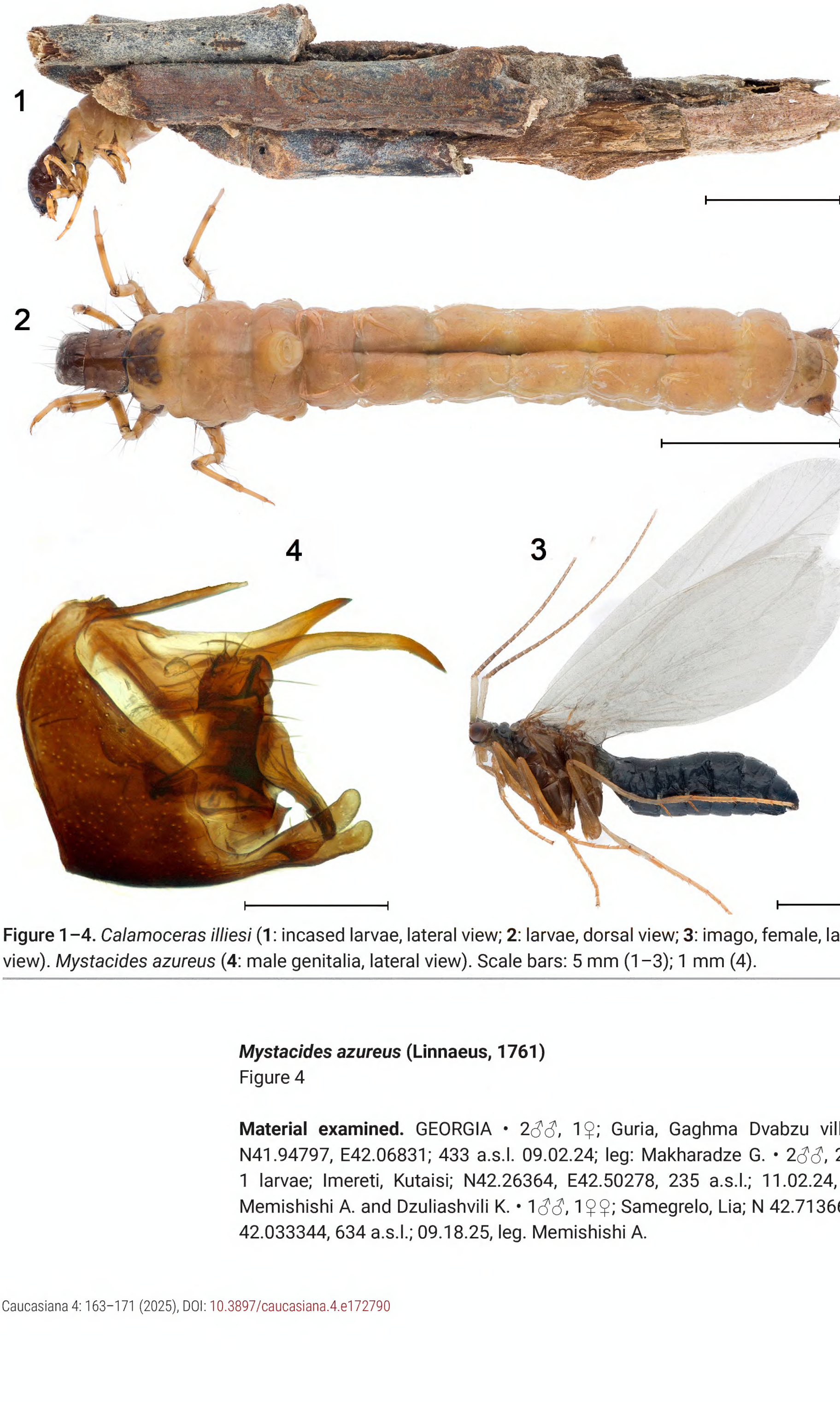

Figure 1–4. *Calamoceras illiesi* (**1**: incased larvae, lateral view; **2**: larvae, dorsal view; **3**: imago, female, lateral view). *Mystacides azureus* (**4**: male genitalia, lateral view). Scale bars: 5 mm (1–3); 1 mm (4).

***Mystacides azureus* (Linnaeus, 1761)**

Figure 4

Material examined. GEORGIA • 2♂♂, 1♀; Guria, Gaghma Dvabzu village; N41.94797, E42.06831; 433 a.s.l. 09.02.24; leg: Makharadze G. • 2♂♂, 2♀♀, 1 larvae; Imereti, Kutaisi; N42.26364, E42.50278, 235 a.s.l.; 11.02.24, leg. Memishishi A. and Dzuliashvili K. • 1♂♂, 1♀♀; Samegrelo, Lia; N 42.713665, E 42.033344, 634 a.s.l.; 09.18.25, leg. Memishishi A.

Figure 5. Habitat of *Calamoceras illiesi* in Georgia.

Remarks. *Mystacides azureus* is one of the most widely distributed species of the genus in Europe. It has been recorded in numerous countries, including the United Kingdom, Germany, France, Italy, and the Balkan Peninsula (Graf et al. 2008). The species is also present in Japan, alongside two newly described species within the *M. azureus* species group (Kuhara et al. 2023). In the Caucasus region, *M. azureus* was previously reported from Russia (Oláh 1985; Ivanov 2011). Notably, the first photographic record of this species in Georgia was made by amateur naturalist Giorgi Makharadze, posted on the Facebook group "Wildlife in Georgia" in 2020.

Discussion

With the two new species reported in this paper, the diversity of Georgian trichopteran fauna has increased to 250 species grouped into 55 genera and 19 families. Of these, 109 species (≈44%) are endemic to Georgia, while 141 species (≈56%) are endemic to the Caucasus. Among the species-rich families, Philopotamidae stands out with a particularly high level of local endemism, with 16 of 26 species (61.5%) found only in Georgia. An additional 37 Caucasian endemics remain unrecorded in Georgia, reinforcing the need for further research.

An unknown representative of the genus *Calamoceras* was recorded by Martynov (1913) in Akhali Atoni (western Georgia) (Fig. 6). We assume that this record probably belongs to *C. illiesi*, however, this assumption requires further confirmation, given the high diversity of trichopterans in the region.

In terms of its habitat, despite extensive and repeated sampling, *C. illiesi* larvae were only found in one stream, which fully matches the species' known habitat

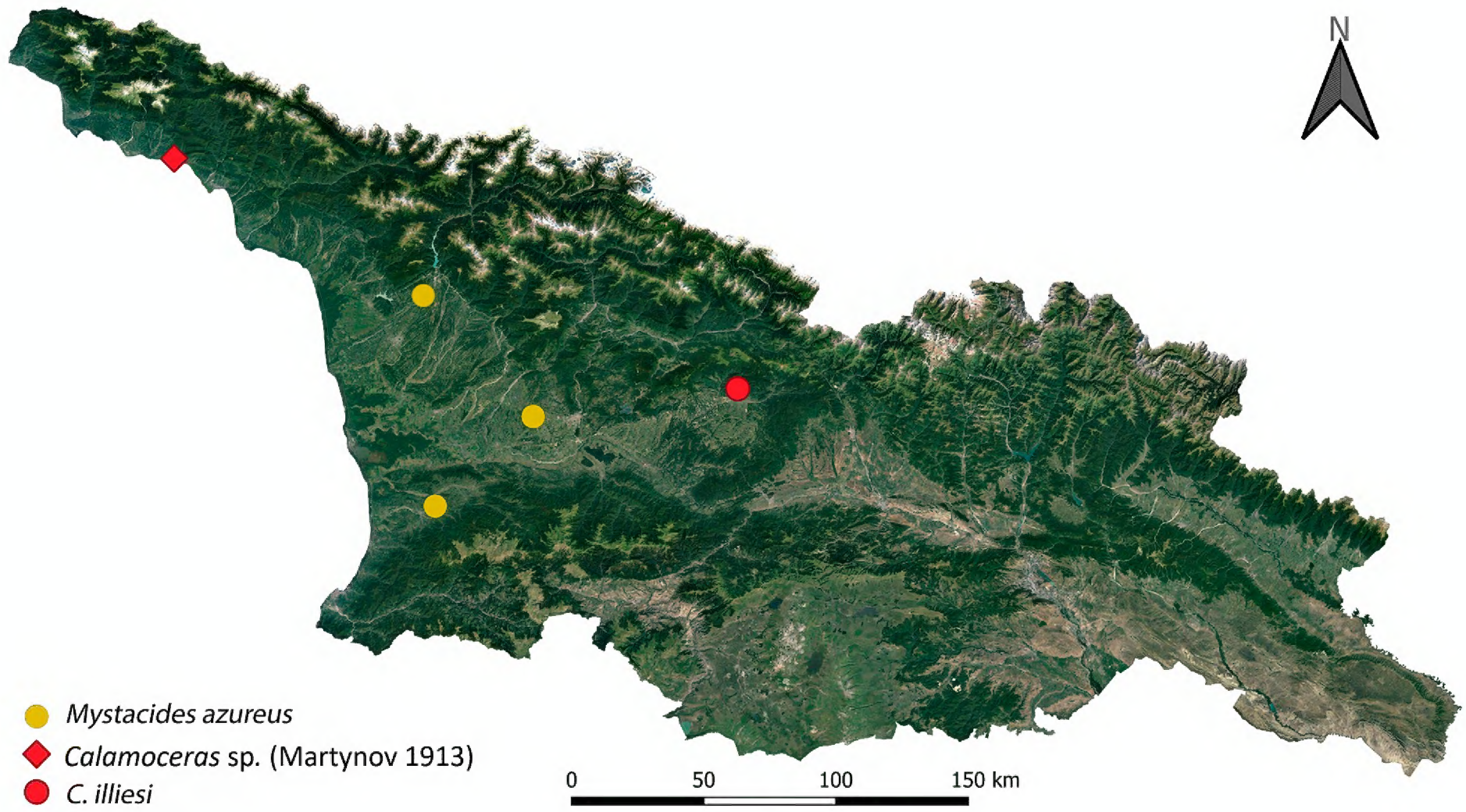

Figure 6. Known records of *Calamoceras illiesi* and *Mystacides azureus* in Georgia.

preferences (Sipahiler 2013). The specimens were located at the edge of a small pond (1–2 m wide) formed by a mountain spring, where the slowed flow allows accumulation of woody debris and leaf litter (Fig. 5). Larvae were absent from nearby streams, suggesting a small, microhabitat-dependent population and highlighting its vulnerability. Consequently, protecting this known habitat is essential for the conservation of this rare species (Evtimova and Kenderov 2016).

Acknowledgements

We would like to express our gratitude to Armen Seropian (Institute of Ecology, Ilia State University) for his valuable comments during manuscript preparation and for specimen photos, and to János Oláh for his valuable help in the identification of *M. azureus*. We are especially grateful to Prof. Levan Mumladze (Director of the Institute of Zoology, Ilia State University) for his valuable comments, editing, and overall support with the manuscript. We also thank the Agency of Protected Areas for granting us collection permit #1131-0-2-202504071131.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Funding

This work was supported by funding from the Institute of Zoology and the Vittorio Tonoli Scholarship Project.

Author contributions

AM and KD wrote the manuscript. Specimen identificati on was carried out by AM. The sampling of materials was performed by AM and KD. BL contributed with supervision and manuscript editing.

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Data availability

All of the data that support the findings of this study are available in the main text or Supplementary Information.

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